KANSAS CLIMATE SUMMARY AND DROUGHT REPORT
Current Conditions, Drought Impacts and Outlook

December 2009

Winter arrives: Snow fall records broken

Most Kansans who wished for a white Christmas had their wishes granted. Daily record snowfall amounts were broken at 17 locations in the state in either the Dec. 8-9 event or on Dec. 25. Gove broke by 0.1 inch a record that had stood since 1902 when it received 7.1 inches on Dec. 9, 2009.

The heavy snowfall combined with high winds caused blizzard conditions that had highway crews working long into the night. North-south roads in many areas were made impassable due to drifting snow. Lieutenant Gov. Troy Findley on Dec. 31, 2009 signed a state disaster declaration because of the record holiday snowstorm. A disaster declaration is a prerequisite for an application for federal emergency funds. If granted, most of the money would be used to offset the cost of snow removal.

Counties named in the declaration: Allen, Anderson, Atchison, Bourbon, Brown, Chautauqua, Cherokee, Cheyenne, Clay, Coffey, Crawford, Decatur, Dickinson, Doniphan, Douglas, Elk, Franklin, Geary, Gove, Greenwood, Jackson, Jefferson, Johnson, Labette, Leavenworth, Linn, Logan, Lyon, Marshall, Miami, Montgomery, Morris, Nemaha, Neosho, Norton, Osage, Phillips, Pottawatomie, Rawlins, Riley, Shawnee, Sheridan, Sherman, Wabaunsee, Washington, Wilson, Woodson and Wyandotte.

Revised Galesburg (Neosho County) precipitation total for 2009 is 74.80 inches, which establishes a new annual statewide precipitation record. Hiawatha held the previous record with 71.99 inches set in 1973.

The statewide average total precipitation during December was 0.97 inches. That's 108% of normal.
The highest temperature in the state, 68 degrees, was recorded at Ashland on Dec. 14. The coldest temperature was minus 17 degrees recorded at Smolan on Dec. 10.

The U.S. Drought Monitor does not presently show drought or abnormally dry conditions anywhere in the state.

CURRENT COUNTY DECLARATIONS

No county drought stage declarations issued by the Governor are presently in effect.

Presidential major disaster declarations affecting Kansas in 2009 are:

- FEMA-1848-DR (Severe winter storm; March 26 -29, 2009)
- FEMA-1849-DR (Severe storms, flooding, high winds and tornadoes; April 25 to May 16, 2009)
- FEMA-1847-DR (Severe storms, tornadoes and flooding; May 8 and May 16, 2009)
- FEMA-1853-DR (Severe storms, tornadoes and flooding; June 5 - 26, 2009)
- FEMA-1860-DR (Severe storms and flooding; July 8-14, 2009).

Up-to-date information regarding designated counties and assistance available due to these declarations is available here: http://www.fema.gov/dhsusda/index.jsp.

U.S. Secretary of Agriculture Tom Vilsack has made the following Primary Natural Disaster Area designations in Kansas:

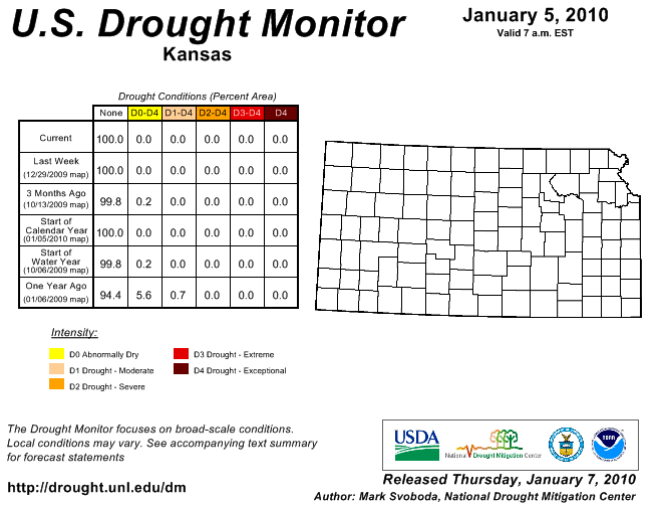
- July 22, 2009 (8 counties) for losses due to excessive rain, flash flooding, flooding, high winds and freeze from March 27 – May 31, 2009, and
- August 29, 2009 (20 counties) for losses caused by heavy rain, flash flooding, high winds and hail from April 27 – July 8, 2009.
- November 6, 2009 (3 counties) for losses caused by high winds and hail from July 17 – September 3, 2009.

A state receives primary disaster declaration when the principal disaster occurs within the state. Counties within Kansas and counties in bordering states that are adjacent to them are identified as “contiguous.” They also are eligible for disaster relief. For additional information regarding these USDA designations, please see: http://www.rurdev.usda.gov/rd/disasters/.

DROUGHT MONITORING AND INDICES

The U.S. Drought Monitor is perhaps the most widely recognized drought monitoring tool in the nation. The Monitor (current map) is a composite of several observed weather variables and drought indices that is updated weekly. It is important to note that the Monitor is intended to provide a “big picture” perspective of conditions across the nation. It is not designed to show local conditions or to replace state and local-level monitoring efforts.

As was the case on December 1, the January 5, 2010 Monitor does not indicate the presence of drought or abnormally dry conditions anywhere in Kansas. The table accompanying the map compares the percentage of the state currently affected by drought conditions with several points during the past year.



In the Kansas county drought stage scheme, a Drought Watch equates roughly to moderate drought in the U.S. Drought Monitor, while a Drought Warning is the equivalent of severe drought. A Drought Emergency is reserved for extreme or exceptional drought.

Palmer Drought Severity Index - The Palmer Index (PDSI) is an indicator used in the U.S. Drought Monitor. The statewide average PDSI for the week ending December 26th was 3.78 (extremely moist). Divisional PDSI values ranged from 2.9 (very moist) in the west central to extremely moist values of 5.48 and 5.14 in the northeast and southeast, respectively.

December Conditions

Average temperature for Kansas during December was 26.4 deg. F. which was 5.5 degrees below the 1971-2000 climatological normal. It was the 13th coldest December in 115 years (1895-2009) of record and the coldest since 2000.

December 2009 was the 39th wettest on record. Statewide total precipitation during December averaged 0.99 inches, which was 0.01 inches above normal, or 101 percent of normal.

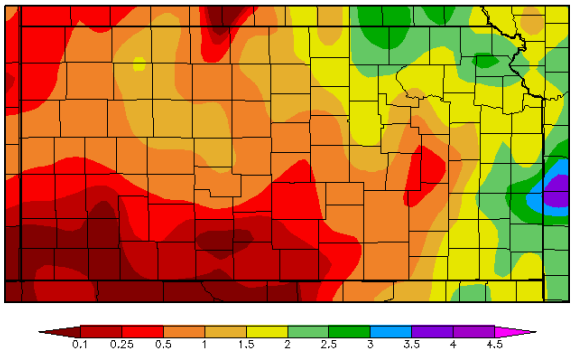
Based on preliminary reports, the greatest total precipitation received in December at National Weather Service COOP network stations, was 3.60 inches at Ft. Scott (Bourbon County). Tops for the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) during December was 4.01 inches, also in Bourbon County.

On the low end, Sublette (Haskell County) received only 0.02 inches of precipitation during December, the least reported by the state’s NWS COOP observers. The driest among CoCoRaHS observers during December was Garden City (Finney County) where 0.04 inches fell.

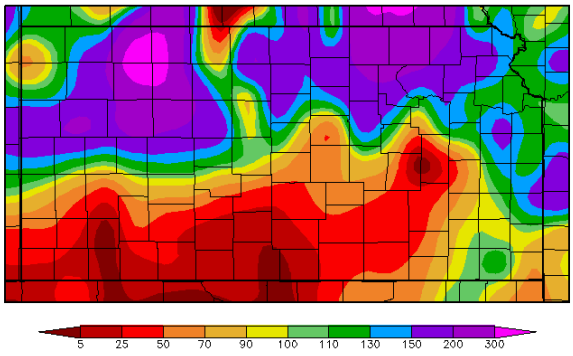
A map showing snow cover is included in Appendix B.

Total precipitation received and the percent of normal across the state in December (below).

Precipitation (in)
12/1/2009 – 12/31/2009

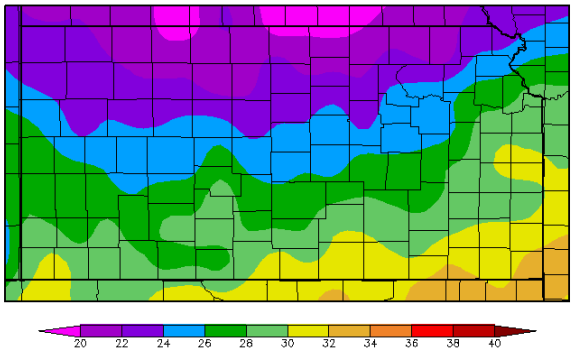


Percent of Normal Precipitation (%)
12/1/2009 – 12/31/2009



The following maps show average monthly temperature and the departure from normal across Kansas during December.

Temperature (F)
12/1/2009 – 12/31/2009



Departure from Normal Temperature (F)
12/1/2009 – 12/31/2009

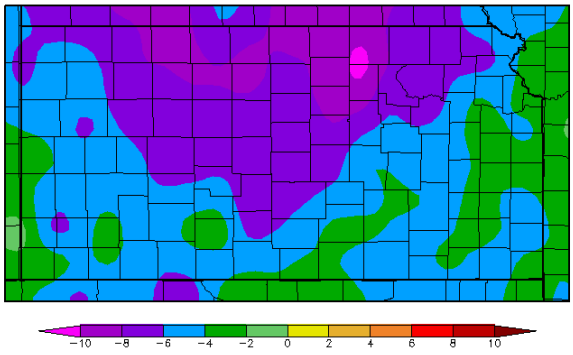


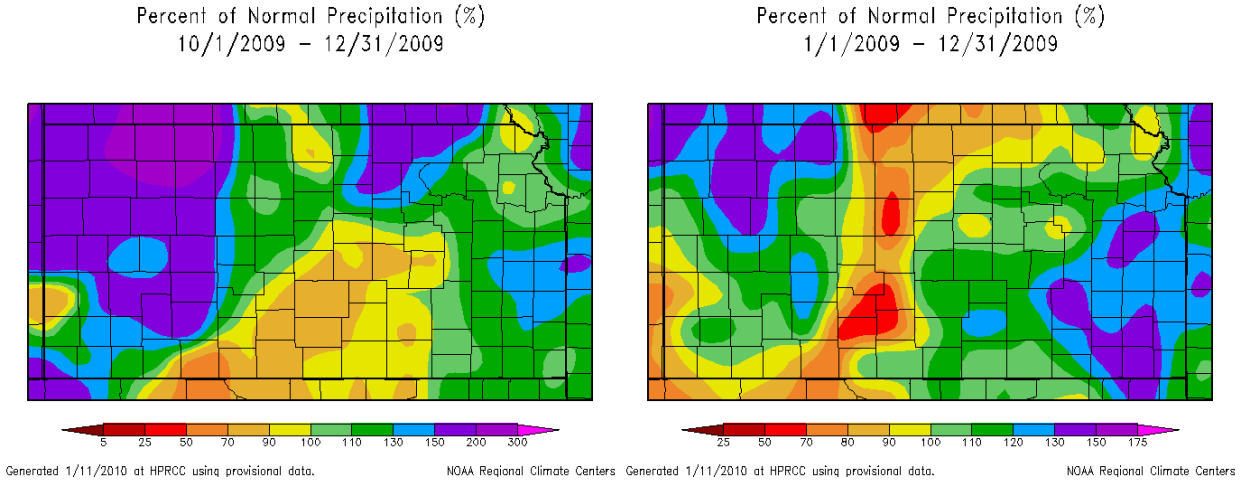
Table 1 summarizes December temperature and precipitation conditions by climate division while Appendix A provides a December summary for principal reporting locations within and adjacent to Kansas. Please note that the data used in compiling Table 1 and Appendix A is preliminary and comes from different sources. This may result in slight differences in the average or extreme values presented.

Table 1
December 2009
Kansas Climate Division Summary

	Precipitation (inches)						Temperature (^{0}F)			
	December 2009			2009 Through December 31					Monthly Extreme	
Division	Total	Dep.[1]	% Norm	Total	Dep.[1]	% Norm	Average	Dep.[1]	Highest	Lowest
Northwest	0.85	0.38	175	27.05	7.79	133	22.3	-7.4	63	-15
West Central	0.79	0.31	162	23.41	3.68	118	24.4	-6.1	64	-14
Southwest	0.20	-0.28	40	20.73	1.38	106	27.9	-4.8	68	-15
North Central	1.44	0.69	193	25.85	-1.09	96	21.6	-7.7	62	-15
Central	1.02	0.11	116	30.85	2.18	107	24.6	-7.0	64	-17
South Central	0.33	-0.69	32	33.10	4.75	125	27.7	-5.5	65	-8
Northeast	2.06	0.83	171	38.67	3.51	109	24.9	-5.0	62	-9
East Central	1.14	-0.27	82	41.83	5.07	114	27.2	-4.8	61	-6
Southeast	1.49	-0.15	87	51.54	13.10	133	30.1	-4.3	58	2
STATE	3.66	1.48	168	30.35	4.75	119	25.6	-5.8	68[2]	-17[3]

1. Departure from 1971-2000 normal value
2. State highest temperature reported from Ashland (Clark County on the 14th.
3. State lowest temperature reported from Smolan 1NE (Saline County) on the 10th.
Source: KSU Weather Data Library

Longer-Term Precipitation Trends - The following two maps show the percentage of normal precipitation received across Kansas during the past three months (October 2009 - December 2009) and during the 12 months (January 2009 - December 2009)



Radar-based precipitation estimate maps covering multiple time periods are available from the National Weather Service. These maps are updated daily. Monthly and annual individual station and county average precipitation data is available from the Weather Data Library at Kansas State University.

DROUGHT IMPACTS AND RESPONSE

Agriculture

The Kansas Crop and Weather Report is updated weekly. Depending on the time of the year, information includes crop conditions and progress, soil moisture conditions, range and pasture conditions, hay and pasture supplies and stock water supplies.

The Report released January 4, 2010 rated topsoil moisture as 4 percent short-very short, statewide, compared with 1 percent short-very short one month ago and 5 percent short-very short at this time last year. The bigger news was the amount of topsoil moisture rated as surplus: 27% in December compared to 13% in November and 9% in Dec. 2009.

Statewide, hay and forage supplies were rated 88 percent adequate and 8 percent surplus. Snow cover and cold temperatures have made it necessary to feed more, drawing down feed supplies

Statewide wheat conditions for the week ended Jan. 1, 2010 were summarized as follows:

- Winter Wheat – 7 percent poor-very poor; 24 percent fair; 69 percent good-excellent

Wind and freezing temperatures did little damage to the winter wheat crop. Cotton harvest was delayed by snow and cold weather but will continue as producers are able to get into the fields. The lack of snow cover on winter wheat fields along with the late planting dates has farmers concerned with the potential for wind damage and winter kill.

Streamflow and Reservoir Levels

The U.S. Geological Survey Kansas Drought Watch provides information on 7-day average streamflow measured at long-term gaging stations and how they compare to normal flows. Most of these gages are located in central and eastern Kansas. A map (click on National Drought Map and then on Kansas) identifies river basins experiencing below normal flows and hydrologic drought.

As of Jan. 6, 2010, no streams were under minimum desirable stream flow administration by the Kansas Department of Agriculture-Division of Water Resources. Twenty-two of the 33 gaging stations where MDS targets have been established are ice affected. Both Concordia and Clay Center were showing flows well above MDS before the cold snap, but both were showing declining flows.

Table 2 summarizes federal reservoir pool elevations on December 31, 2009 in terms of departure from the top of the conservation/multipurpose pool and pool elevation change since November 30th.

Table 2
Kansas Federal Reservoirs
End-of-Month Pool Elevation Summary

		Pool Elevation (Feet MSL)		12/31/2009	
Reservoir	Top MP/C Pool[1]	11/30/09	12/31/09	Departure from Top[2]	Change from 11/30/2009[2]
Kansas River Basin					
Norton[3]	2304.3	2294.4	2294.6	-9.7	0.2
Harlan County, NE	1946.0	1945.2	1946.1	0.1	0.9
Lovewell[3]	1582.6	1579.1	1579.3	-3.3	0.2
Milford[3]	1144.4	1146.6	1144.2	-0.2	-2.4
Cedar Bluff	2144.0	2127.5	2127.5	-16.5	0.0
Kanopolis[3]	1463.0	1462.1	1462.2	-0.8	0.1
Wilson[3]	1516.0	1516.7	1516.5	0.5	-0.2
Kirwin[3]	1729.3	1730.0	1729.4	0.7	-0.6
Webster[3]	1892.5	1893.9	1893.1	0.6	-0.8
Waconda[3]	1455.6	1456.1	1455.2	0.4	-0.9
Tuttle Creek[3]	1075.0	1079.1	1072.2	-2.8	-6.9
Perry[3]	891.5	893.8	892.9	1.4	-0.9
Clinton[3]	875.5	876.9	875.9	0.4	-1.0
Pomona[3]	974.0	976.2	972.0	-2.0	-4.2
Melvern[3]	1036.0	1037.7	1034.7	-1.3	-3.0
Hillsdale[3]	917.0	917.9	918.0	1.0	0.1
Arkansas River Basin					
Cheney	1421.6	1421.7	1421.8	0.2	0.1
El Dorado	1339.0	1339.4	1339.0	0.0	-0.4
Toronto[3]	901.5	908.9	903.8	2.3	-5.1
Fall River[3]	948.5	956.4	951.2	2.7	-5.2
Elk City[3]	796.0	798.5	796.9	0.9	-1.6
Big Hill	858.0	858.2	858.3	0.3	0.1
Council Grove[3]	1274.0	1274.2	1274.2	0.2	0.0
Marion[3]	1350.5	1350.7	1349.7	-0.8	-1.0
John Redmond[3]	1039.0	1041.1	1039.6	0.6	-1.5

1. Seasonal pool operation at El Dorado, Toronto, Fall River, Elk City, Council Grove and John Redmond reservoirs.
2. All values are in feet. Negative departures or changes are shown in red.

Source: U.S. Army Corps of Engineers

3. Lake level management plan in place

To better manage a reservoir for multiple purposes, lake level management plans have been developed. The water levels of these lakes fluctuate during a year according to the management plan. Lake level management plans are posted on the Kansas Water Office web site www.kwo.org

Public Water Systems

No drought-related public water system impacts are currently being reported.

Several publications provide guidance regarding drought preparedness and response. The The 2007 Municipal Water Conservation Plan Guidelines replace previous guidelines dating back to 1990. These guidelines cover drought response in addition to long-term water conservation.

The Drought Vulnerability Assessment Report identifies those systems most likely to first be impacted by drought and the reason for their vulnerability. It was updated in 2007 to reflect system conditions as of 2006.

Responding to Drought: A Guide for City, County and Water System Officials provides an overview of Kansas county drought stage declarations, local planning and coordination, disaster declarations, and available state and federal assistance.

Vegetation Conditions

The Kansas Applied Remote Sensing Program (KARS) at the University of Kansas produces a Kansas Green Report each week during the growing season. This report consists of a set of five interactive maps derived from satellite and historic data that illustrate vegetation conditions and crop progress across the state.

The Vegetation Condition Index Map, included in the Green Report, illustrates vegetation health and levels of plant stress based on current and historic vegetation greenness and surface temperatures. Production of this map will resume in March 2010.

The Vegetation Drought Response Index (VegDRI) provides another perspective on vegetation conditions across the state. VegDRI attempts to isolate the impact of drought or other moisture conditions from other factors that influence vegetation condition.

The VegDRI map is updated on a bi-weekly basis; it is currently out-of-season for Kansas.

Wildfire

No large wildfires were reported to the Kansas Forest Service in December. Wildfires burning at least 300 acres in grass/brush or 100 acres in timber are considered large.

The Wildland Fire Outlook issued by the National Interagency Fire Center on January 4 foresees near normal significant wildfire potential across Kansas during the January-March 2010 period. Significant fire potential is defined as the likelihood that a wildfire will require mobilization of additional resources from outside the area in which the fire originated. Good news is that abundant soil moisture to enhance spring vegetative growth and snows that matted dried grass that would serve as fuel will reduce the risk of wildfire. Strong, dry winds, should they occur, will counter those advantages.

A look back at 2009. In past years, every month has had a major fire somewhere in Kansas. In 2009, no major fires, as defined above, were reported since April.

The National Weather Service provides a full range of fire weather products and services for Kansas. Included are the Rangeland Fire Danger Index, Fire Weather Forecasts, Red Flag Watches/Warnings, and Spot Forecasts. Each NWS office serving Kansas has these products available on its website. These websites may be accessed from this county warning and forecast area map. Clicking on one of these areas takes you to that NWS Office's home page. Look for "Fire Weather" in the menu on the left margin of the page.

Fire weather links also are available from the Weather Data Library at Kansas State University, as are prescribed burning guidance publications.

LOOKING AHEAD

The Seasonal Drought Outlook, developed by the NOAA Climate Prediction Center (NOAA CPC), assesses the likelihood for improvement, persistence or deterioration in drought conditions for areas currently experiencing drought as identified by the U.S. Drought Monitor. The Outlook released January 7 for the period through March 2010 (see below) indicated that development of drought conditions in Kansas is unlikely.

ADDITIONAL INFORMATION

The Kansas Climate Summary and Drought Report is compiled by the Kansas Water Office from various federal, state, local and academic sources. The report summarizes conditions at the end of the month indicated. Some data used is preliminary and is subject to change when final data is available at a later date.

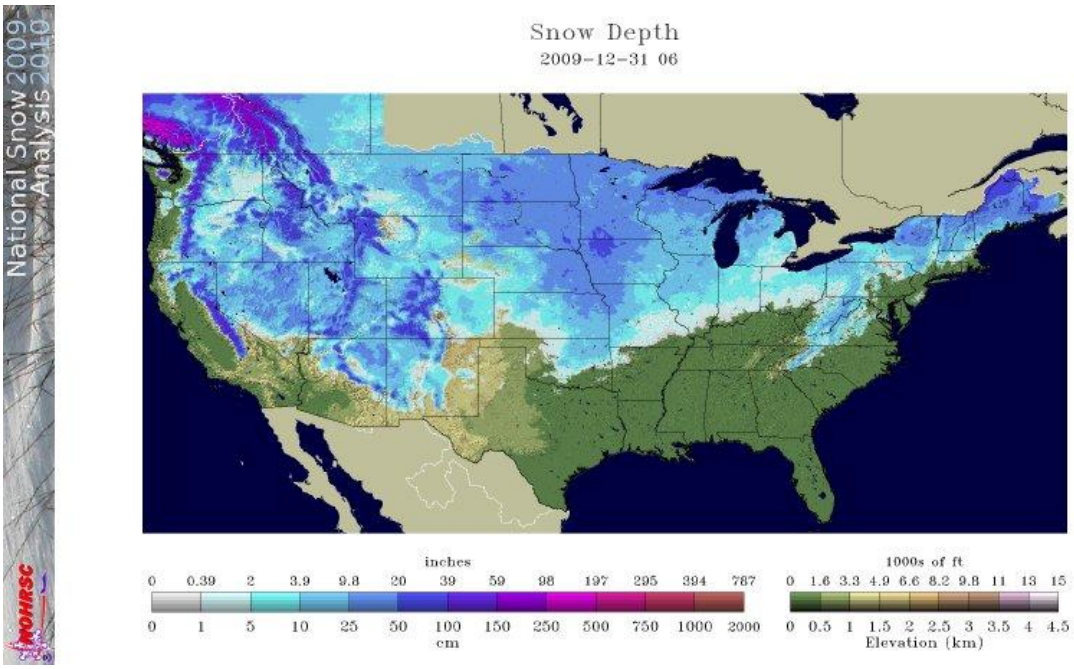
The Kansas Water Office web site, KWO Drought, contains additional drought information including links to other agencies with drought information and past issues of the Kansas Climate Summary and Drought Report. The Operations Plan for the Governor's Drought Response Team is also available here.

Please contact Hank Ernst at the Kansas Water Office (785/296-1007) or hank.ernst@kwo.ks.gov should you have any questions or suggestions.

Appendix A
December 2009
Kansas Regional Climate Summary

	Precipitation (inches)			Temperature (^{0}F)			
						Extreme (Date)	
Station1	Total	Departure	Percent Normal	Mean	Departure	Highest	Lowest
West							
Burlington, CO	0.74	0.40	218%	23.5	-5.5	63 (21)	-14 (9)
Dodge City	0.01	-0.34	3%	29.0	-0.6	61 (17)	-3 (8)
Garden City	T	-0.20	0%	29.0	0.2	62 (13,12)	-5 (8)
Goodland	0.50	0.10	125%	23.3	-6.3	63 (21)	-12 (9)
Guymon, OK	0.22	-0.12	65%	31.1	-4.2	66 (13)	1 (10)
Hill City	0.91	0.40	178%	22.4	-7.7	60 (1)	-7 (9)
Lamar, CO	0.19	M	M	24.7	M	67 (21)	-14 (9)
McCook, NE	0.05	-0.23	18%	26.0	0.0	60 (13)	-7 (8)
Springfield, CO	0.10	M	M	27.6	M	66 (21)	-8 (9)
Central							
Concordia	1.54	0.68	179%	21.3	-8.9	60 (1)	-5 (10)
Hebron, NE	M	M	M	M	M	58 (1)	M
Medicine Lodge	0.25	-0.62	29%	30.5	-2.8	58 (20)	2 (10,9)
Ponca City, OK	0.15	M	M	32.9	-4.2	63 (13)	8 (10)
Salina	0.29	-0.65	31%	24.8	-7.8	60 (1)	-9 (10)
Wichita (ICT)	0.39	-0.96	29%	29.9	-3.7	57 (1)	4 (10)
East							
Bartlesville, OK	1.95	-0.06	97%	33.1	-5.5	59 (21,17)	5 (10)
Chanute	1.85	-0.04	98%	30.9	-3.6	57 (23)	6 (10)
Fall City, NE	2.43	1.4	236%	22.8	-5.4	62 (1)	-6 (10)
Johnson Co. Exec. Apt	1.15	-0.61	65%	28.4	-4.7	57 (1)	2 (10)
Joplin, MO	2.03	-0.93	69%	32.4	-4.3	58 (21)	6 (10)
Kansas City (MCI), MO	1.69	0.05	103%	28.5	-2.8	59 (1)	0 (10)
St. Joseph, MO	1.6	0.16	111%	24.7	-5.8	59 (1)	-7 (11)
Topeka (TOP	1.94	0.52	137%	28.1	-3.3	61 (1)	-4 (10)

1. Airport Automated Observation Stations (NWS/FAA)
2. Departure from 1971-2000 normal value
T - Trace; M - Missing; --- no normal value from which to calculate departure or percent of normal
Source: National Weather Service F-6 Climate Summaries



Source: National Operational Hydrologic Remote Sensing Center.